The U.S. Measurement System

A New NIST Initiative

Imagining Metrology for Telemedicine

USMS Workshop
NIST AML Conference Room
December 7, 2005

USMS
What is it?

- The U.S. Measurement System (USMS) is the complex of methods, instruments, entities, institutions and standards involved in the measurement of products and processes significant to the economy, security, and quality of life in the United States

NIST/USMS Objective

NIST will:

- Lead an effort to document measurement and measurement-related standards needs for the United States system-wide.
- Advocate solutions for identified needs, either from NIST or from other U.S. Measurement System participants.

NIST Mission

- The overall NIST mission is to assist others with standards and metrology solutions.
- NIST does not set standards or serve as a regulatory body.
- NIST will work with others, as a neutral party, to make sure standards are in place.
- NIST serves as a Bedrock of Metrology for US Industry, an Unbiased Broker

What is New?

- Historically, NIST has limited its needs assessment to areas appropriate for NIST technical solutions.
- USMS is of much broader scope and addresses the full range of U.S. measurements and measurement-related standards needs.
- NIST will help coalesce stakeholder recognition of shared needs. This will lead to more timely solutions from NIST and other providers.

The USMS Assessment

- Working with other stakeholders, NIST will prepare a “U.S. Measurement Needs and Opportunities Assessment,” a high-level identification of critical national needs, together with an estimate of the costs of non-action.
- This assessment will be provided to Congress and the Administration.

Assessment Process

- Developing an assessment of national measurement needs is a continuing process. A truly comprehensive assessment will take some years to prepare.
- The initial needs assessment will be produced in the Summer of 2006.
- The assessment will focus on measurement problems that pose technical barriers to technological innovation.

YOU CAN HELP

- The process begins with an initial needs assessment.
- Identification of stakeholder needs is crucial for a comprehensive assessment.
- Opportunities will be provided for public statements of need by USMS stakeholders.
  - FALL 2005: Focused workshops on key technology areas.

Questions to Answer

1. What phenomena do you need to observe and measure, but cannot do so?
2. What validated reference standards or facilities will be needed, but are currently unavailable?
3. What measurements or reference standards do you need to have incorporated into product or process standards to enable broad use?
4. What are the relevant economic impacts? (Anecdotes OK)
5. What actions do you recommend?

Trends in Telemedicine

- Many states are establishing their own telemedicine infrastructures. Likely outcomes are:
  - The infrastructure in one state may not be completely compatible with the telemedicine infrastructures in other states.
  - This may not bode well for responding effectively to emergencies involving two or more states.

Trends, con't

- Partnering with existing broadband providers will lower costs.
- Telemedicine will permit single episodic examinations to be replaced by continuous monitoring of health parameters such as blood pressure, glucose levels, heart arrhythmias, and the like.

Cultural Challenges

- Healthcare telemedicine vendors must get over their proprietary concerns associated with deploying technologies. Likely outcomes of not doing so are:
  - Increased NTSC (not the same color) twice or not the same image twice
  - Very slow deployment of telemedicine technology

Cultural Challenges, con't

- Re-engineering consumer technologies for telemedicine applications requires interoperable standards and rational regulation.
- Incorporating telemedicine into first responder emergency plans at both state and Federal levels

Technical Challenges

- Standards for getting all telemedicine equipment to communicate with one another
- Validated performance metrics for assessing image quality from acquisition /generation, processing, transmission, storage, to display
- A very high data rate network for all telemedicine stakeholders
- Standard terminology and reporting language for all medical sub-specialties and users

Technical Challenges, con't

- Courses to teach clinicians, physicians, and medical technologists about assessing and managing image quality from acquisition to display
- Developing measurements to verify compliance with standards and accepted practices; e.g., HL7

A Role for NIST

- Issues of Interoperability
- Image Quality from Acquisition to Display
- Validation of Standards use
- Training
- Standard Language Specification

NIST/NIH
Planned USMS Workshop

Location: NIH Campus
Natcher Center
Bethesda, MD

Date: December 7, 2005

Time: 8:30 AM – 5:00 PM

Details found at:

http://usms.nist.gov/workshops/

Workshop Goals:

1. Capture the most important measurement and standards (M&S) related needs facing your industry.
2. Agree with your colleagues on which M&S challenges are most important to pursue. Recommend solution providers.
3. Begin a systematic and ongoing dialog and consultation process related to your M&S needs.
4. Begin to reduce available M&S technology as impediments to technical advancement.
5. Increase American efficiency and quality.
6. Working together, we can take steps to protect and enhance American competitiveness.

Interoperability

- Medical Device Communication
  - Point of Care (PoC)
  - Described as “chaos” in terms of standards
- Standards for communication protocols for medical devices
  - Technical – Architecture
  - Semantic - Protocols, Data Object Properties/Codes
- ATA Working Group is very active
  - Looking for NIST input
  - Using IEEE, ISO guidelines for:
    - Device Data and Services
    - General Application Services
    - Transport and Physical Layers
    - Internetworking Support
    - Application Gateways
    - MDDL, Medical Device Data Language development
    - Cable and Wireless
- Likely NIST group - IT

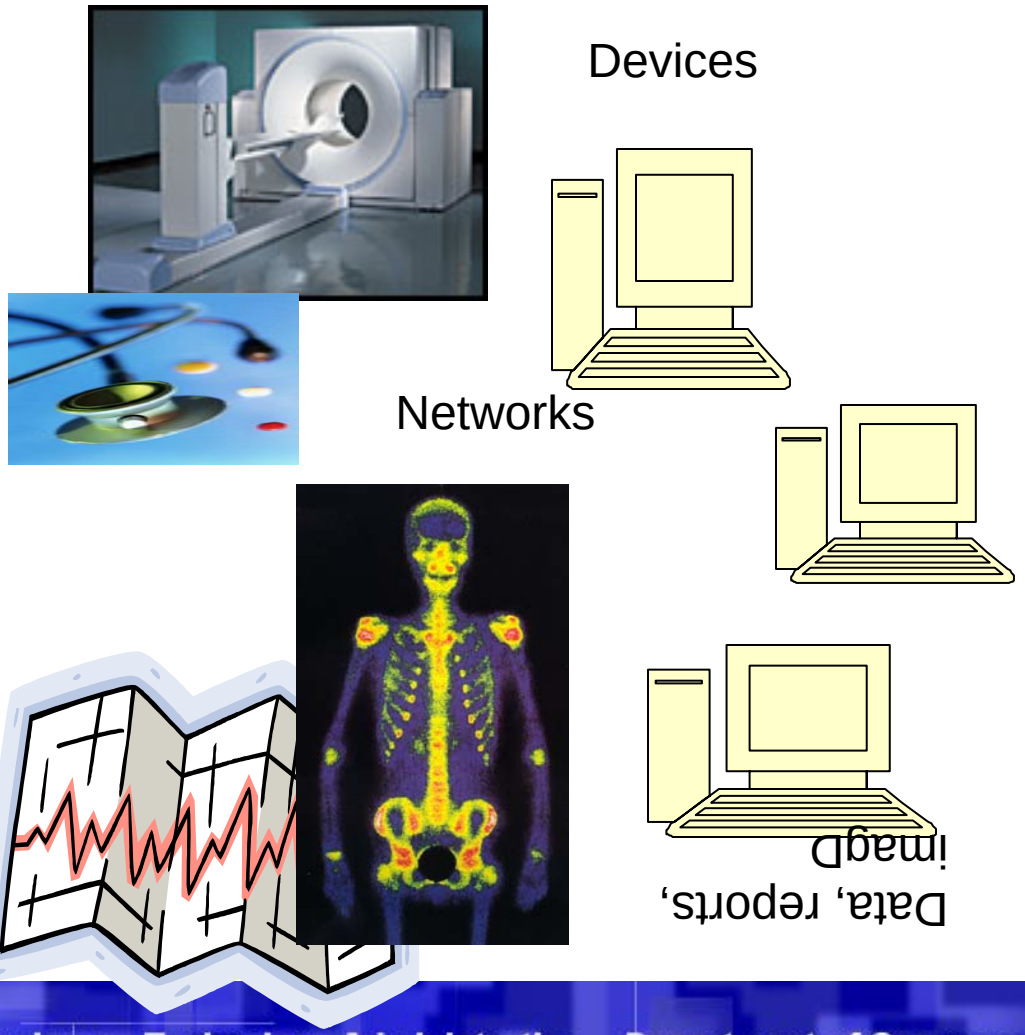

Image Quality

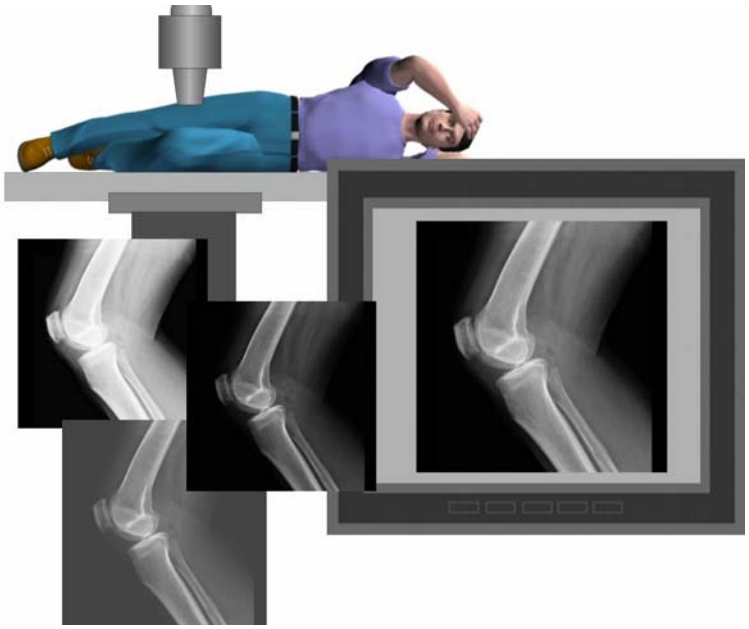

Image Quality, con't

- Color Issues
  - DICOM Standard
- Real Life Image Measurement Assurance
  - Scaling Quality Standards
    - Home Care
    - Acute Care
- Calibrations (Accuracy, Precision)
  - Medical Devices
  - Active Device Testing
- Qualitative Analysis of Images
  - Terminology
  - Measurement Methods
  - Assessment of Accuracy and Precision
- Standard Images
- Cross Industry Standards
  - Uniformity in image rendering across medical industry